

What is claimed is:

1. A packet transfer path control apparatus which controls a transfer of a unicast packet and a
5 multicast packet, comprising:

an output port determination unit determining an output port through which a packet input from any of one or more input ports is to be output, and assigning output order identification information
10 for designation of an output order of the packet;

a packet data storage unit storing data of the input packet; and

a plurality of packet output units respectively corresponding to the plurality of
15 output ports, each packet output unit reading data of a packet determined by said output port determination unit to be output through a corresponding output port associated with the packet output unit in an output order indicated by
20 the output order identification information from said packet data storage unit, and outputting the read data through the corresponding output port.

2. The apparatus according to claim 1, further
25 comprising:

a unicast packet management information storage unit storing for each output port management information including a storage position in said packet data storage unit of the data of each unicast packet to be output through the output port and output order identification information for the unicast packet; and

a multicast packet management information storage unit provided for each output port and storing, for each of the multicast packets to be output through the output port, management information including a storage position in said packet data storage unit of the data of the multicast packet and output order identification information of the multicast packet.

3. The apparatus according to claim 2, wherein said packet output unit for each output port compares output order identification information about a next output unicast candidate of packets whose packet management information is stored in said unicast packet management information storage unit with output order identification information about a next output multicast candidate of packets whose packet management information is stored in

said multicast packet management information storage unit, and determining a packet to be output next from the output port.

- 5 4. The apparatus according to claim 1, wherein
 said output order identification information
 is serial numbers indicating input orders of all
 packets input through all input ports, or a serial
 number for all packets input through each output.

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5. A packet transfer path control apparatus
 which controls a transfer of a unicast packet and a
 multicast packet, comprising:

 an output port determination unit determining
15 an output port through which a packet input from
 any of one or more input ports is to be output;

 a pointer storage unit storing for each
 output port a pointer to a location where there is
 stored data of a last input one of the unicast
20 packets to be output through the output port or
 packet management data for the last input unicast
 packet;

 a packet data storage unit storing data of
 each input packet;

25 a packet output unit provided for each output

port, reading data of a packet determined by said output port determination unit to be output through the output port in an output order for guarantee of an input/output order of a unicast packet and a
5 multicast packet based on stored contents of said pointer storage unit from said packet data storage unit, and outputting the read data through the output port.

10 6. The apparatus according to claim 5, further comprising:

a unicast packet management information storage unit storing for each output port packet management information including a storage position
15 in said packet data storage unit for data of each unicast packet to be output through the output port; and

a multicast packet management information storage unit provided for each output port and
20 storing packet management information including a storage position in said packet data storage unit for data of each multicast packet to be output through the output port, and a value of a pointer read corresponding to the output port from said
25 pointer storage unit when the multicast packet is

input.

7. The apparatus according to claim 6, wherein
said pointer points to a storage position in
5 said packet data storage unit for data of a last
input unicast packet, or a storage position of
packet management information corresponding to the
unicast packet in said unicast packet management
information storage unit.

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8. The apparatus according to claim 7, wherein
said packet output unit for each output port
storing a storage position in said unicast packet
management information storage unit of packet
15 management information for a unicast packet output
immediately before from the output port, comparing,
when a next packet is to be output through the
output port, a value of the pointer to a next
output candidate of multicast packets whose packet
20 management information is stored in said multicast
packet management information storage unit with the
storage position, and outputting a multicast packet
when the value match the storage position or
outputting a unicast packet when the value does not
25 match the storage position.

9. A program used to direct a computer to control a transfer of a unicast packet and a multicast packet, comprising:

5 a procedure of determining one of output ports through which one a packet input through an input port is to be output;

a procedure of, if the input packet is a unicast packet to be output through the one output port, writing, for the one output port, order
10 identification information assigned for the unicast packet in a table storing for each output port the management information about each unicast packet to be output thorough the output port, the order
15 identification information being assigned to all packets to be output through all of the output ports or all packets to be output through each port in to input order; and

a procedure of, if the input packet is a
20 multicast packet to be output through the one output port, writing order identification information assigned for the multicast packet in a table provided for the one output port and storing the management information about each multicast
25 packet to be output through the one output port,

the order identification information being assigned to all packets to be output through all of the output ports or all packets to be output through each port in to input order.

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10. The program according to claim 9, further comprising:

10 a procedure of reading order identification information about a unicast packet to be output next from a table storing unicast packet management information corresponding to an output port, and reading order identification information about a multicast packet to be output next from a table storing multicast packet management information;

15 and

a procedure of comparing the two read values of order identification information, and determining which packet is to be output next through the output port, a unicast packet or a

20 multicast packet.

11. A program used to direct a computer to control a transfer of a unicast packet and a multicast packet, comprising:

25 a procedure of determining one of output

ports through which one a packet input through an input port is to be output;

a procedure of, when the input packet is a unicast packet, storing for the one output port a storage address in a table storing management information about the input packet or a storage address in a table storing the data of the input packet; and

a procedure of, when the packet is a multicast packet, writing in a table storing management information about a multicast packet for each output port through which the packet is to be output a storage address in a table storing management information about a unicast packet stored corresponding to the output port or a storage address in a table storing the data of the packet.

12. The program according to claim 11, further comprising:

a procedure of reading a storage address in a table storing management information about the unicast packet corresponding to a multicast packet to be next output, or a storage address in a table storing data of a unicast packet from a table

storing management information about a multicast packet for each output port;

5 a procedure of comparing the read storage address in a table storing management information about the unicast packet or a storage address in a table storing data of the unicast packet with a storage address in a table storing management information about the last output unicast packet or the storage address in a table storing the data of
10 the packet, and determining which is to be output from the output port, a unicast packet or a multicast packet; and

a procedure of, when a unicast packet is output, storing a storage address in a table
15 storing management information about the unicast packet to be output or a storage address in a table storing data of the packet.

13. A packet transfer path control apparatus
20 which controls a transfer of a unicast packet and a multicast packet, comprising:

output port determination means for
determining an output port through which a packet
input from any of one or more input ports is to be
25 output, and assigning output order identification

information for designation of an output order of the packet;

packet data storage means for storing data of the input packet; and

5 packet output means provided for each of a plurality of output ports for reading data of a packet determined by said output port determination unit to be output through the output port in an output order indicated by the output order
10 identification information from said packet data storage means, and outputting the read data through the output port.

14. A packet transfer path control apparatus
15 which controls a transfer of a unicast packet and a multicast packet, comprising:

output port determination means for
determining an output port through which a packet
input from any of one or more input ports is to be
20 output;

pointer storage means for storing for each
output port a pointer to a last input one of
unicast packets to be output through the output
port, or packet management information about the
25 last input unicast packet;

packet data storage means for storing data of each input packet;

a plurality of packet output means provided for a plurality of output ports for reading data of
5 a packet determined by said output port determination means to be output through the output port in an output order for guarantee of an input/output order of a unicast packet and a multicast packet based on stored contents of said
10 pointer storage means from said packet data storage means, and outputting the read data through the output port.